NOVEL ORGANOMETALLIC COMPOUNDS FOR CANCER TREATMENT

A.Zhanbossinova, S.Yespolayeva, G.Khamitova, B.Negmetzhanov, K.Alibek, S.Adilov*

NURIS, Nazarbayev University, Astana, Kazakhstan *sadilov@nu.edu.kz

INTRODUCTION

Organometallic compounds based on platinum have been extensively used for cancer treatment over the past few decades. However, major clinical problems, including high toxicity to normal healthy cells, low selectivity, and acquired or intrinsic resistance, often lead to the fail of complete cancer remission and numerous undesirable side effects. Ruthenium and ferrocene based compounds have shown promising anticancer effect with low general toxicity, and lesser drug resistance [1-2].

AIM OF THE PROJECT

Synthesis of organometallic compounds based on ferrocene and ruthenium metals with combination of indole, resorcinol and porphyrin derivatives and test them for anticancer activity.

METHODOLOGY

The synthesis of ferrocene containing organometallic compounds was implemented by cross-aldol condensation, Friedel–Crafts alkylation, and carbon-carbon coupling. In the case of ruthenium compounds, ligands with different functional groups were used to form complexes. The products synthesized were characterized by FT-IR and ^{1}H NMR techniques. Finally, these compounds will be tested *in vitro* on breast cancer, and later other cancer cell lines.

RESULTS AND DISCUSSIONS

Incorporating indole, resorcinol, and porphyrin derivatives into ferrocene and ruthenium complexes could improve their anticancer activity [3]. These compounds are furnished with functional groups which are expected to induce programmed cell death and show high selectivity to cancer cells. Currently, they are at the stage of *in vitro* testing for anticancer activity.

FUTURE WORK PLANS

With the aim to reduce the toxicity and to deliver an anticancer agent directly to the target cell without or lesser side-effects, it is planned to encapsulate synthesized complexes with the synthetic biodegradable and biocompatible polymers. Attention will also be given toward examining the mode of actions of compounds to see the interaction with DNA and impact on the cell cycle.

ACKNOWLEDGEMENTS

The authors would like to thank Nazarbayev University for the provision of a seed grant.

REFERENCES.

1. A. Levina, A. Mitra, P.A. Lay. (2009). Recent developments in ruthenium anticancer drugs. Metallomics, 1: 458-470.
2. S.S. Braga, A.M.S. Sliva. (2013). A new age for iron: Antitumoral ferrocenes. J. Organometallics, 32: 5626-5639.
3. M. Auzias, B. Therrien, G. Suss-Fink, P. Stepnichka, W.H. Ang, P.J. Dyson. (2008). Ferrocenoyl pyridine arene ruthenium complexes with anticancer properties: synthesis, structure and cytotoxicity. Inorg. Chem. 47: 578-583.